

FLORA COSTARICENSIS

Family #97 Krameriaceae

Family #98 Oxalidaceae

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Family #102 Erythroxylaceae

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KRAMERIACEAE

By William Burger and Beryl B. Simpson

REFERENCE—B. B. Simpson, Krameriaceae. Flora Neotropica Monogr. 49: 1–108. 1989.

Perennial herbs, **shrubs**, or rarely small trees, usually vestitured with single-celled hairs, hemiparasitic on the roots of other plants; stipules absent. **Leaves** alternate or fasciculate, simple in Central America (rarely trifoliate), petiolate or sessile, the leaf blades with entire margins. **Inflorescences** of single axillary flowers, terminal racemes (by condensation of internodes and loss of leaves) or open panicles, peduncles with 2 opposite foliaceous bracts, pedicels variable. **Flowers** bisexual, bilaterally symmetrical (zygomorphic), hypogynous, colorful parts pink, rose, or purple, rarely reddish brown to yellow, imbricate, deciduous, sepals (4–)5, free and petaloid, showy, unequal with the 3 outer usually larger than the inner sepals and the petals; **petals** (4–)5, unequal and dimorphic, small, the 3 upper (adaxial) long-clawed, united near the base in some species, the petal-laminae small or absent, the 2 lower (abaxial) petals smaller, thick, sessile, laterally flanking the ovary, glandular on the dorsal surfaces (and called elaiophores); **stamens** (3–)4, usually alternating with the 3 upper petals and angled downward and outward, filaments thick, free or united near the base or adnate to the bases of the adaxial petals, anthers basifixed, dehiscent near the apex by membranous pores, pollen 3-porate (3-colporate), the pores often expanded equatorially; **pistil** 1, of 2 united carpels with one developing and the other vestigial, ovary with 1 locule with 2 pendulous ovules from an axial placenta near the top of the locule, style obliquely terminal, stigma simple. **Fruit** 1-seeded, dry and indehis-

cent, usually covered with spines, the spines often with retrorse barbs; seeds globose with a smooth seed coat, with a straight embryo and 2 thick cotyledons, endosperm absent.

A monogeneric New World family with 17 species ranging from the southwestern United States (with disjunct populations in Florida and Georgia), Mexico, and the West Indies southward to northern Chile and Argentina. Major centers of species diversity are in northern Mexico and central and eastern Brazil. All the species are found on sandy or rocky soils in arid or seasonally dry climates. The family is not now of commercial importance, but the roots have been used medicinally and as a source of yellow and reddish brown dyes. The Krameriaceae were once thought to be closely related to the Leguminosae, but a relationship with the Polygalales is more likely.

Krameria Loefling

With the characters of the family (see above). The genus is quite distinctive because of its zygomorphic flowers, the unique configuration of calyx and corolla, and its unusual fruit. The flowers are usually held erect with the longitudinal plane of the open perianth vertical, somewhat like those of *Senna* or *Cassia* (Leguminosae). This orientation and the unusual morphology of the flowers are part of an interesting pollination syndrome in which the lower petals secrete lipids that are collected by female *Centris* bees. The flora parts were misinterpreted in the past; see the article by B. B. Simpson (1982) and the monograph cited above.

Key to the Species of *Krameria*

- 1a. Leaves with distinct petioles, leaf blades narrowly elliptic to lanceolate and gradually narrowed at the base; flowers pinkish fading to white *K. ixine*
- 1b. Leaves sessile or subsessile, leaf blades linear to linear-lanceolate, abruptly narrowed at the base; flowers yellow and dusky rose *K. revoluta*

Krameria ixine Loefl., *Iter hispan.* 195. 1758. *K. cuspidata* K. Presl, *Reliq. haenk.* 2: 103. 1835. Figure 1.

Small shrubs, erect to 1(-1.5) m tall, often many branched and to 1 m broad, internodes 1-15(-25) mm long, leafy stems 1-3(-4) mm thick, densely strigillose with thin whitish or grayish hairs 0.2-0.8 mm long. Leaves simple, petioles 3-7(-9) mm long, merging gradually with the decurrent lamina-base, strigillose; leaf blades 8-20 (-33) mm long, 3-8 mm broad, narrowly oblong or narrowly elliptic to narrowly obovate or lanceolate, acute with a spinose tip 0.5-1.5 mm long, acute at the base and decurrent on the petiole, obscurely palmately 3-veined, densely strigillose. Inflorescence in lateral or terminal racemes, peduncles usually shorter than the subtending leaves, with a pair of opposite bracts in the middle, densely strigillose. Flowers ca. 8 mm long and 12 mm broad when dry, perianth rose-pink to deep red, magenta or reddish brown, turning white with age, sepals 4-10 mm long, broadly oblong, densely whitish sericeous on the outer surfaces; upper petals united in the lower half; stamens didynamous with anthers ca. 1 mm long. Fruit globose, body of the fruit 4-7 mm in diameter, covered with short (1 mm) whitish hairs and longer (1.6-4.6 mm) orange or reddish spines with thin retrorse barbles distally.

Plants of seasonally deciduous vegetation along the Pacific slope of Mexico and Central America. Growing from near sea level to 400 m elevation in Costa Rica (to 1000 m in Honduras and 1500 m in Guatemala). Flowers and fruits have been collected during the wet season in Costa Rica (late May to December). This species ranges from western Mexico (Sonora) to northwestern Costa Rica, through most of the Greater and Lesser Antilles, and into South America in northeastern Colombia, northern Venezuela, and eastern Guyana.

Krameria ixine is recognized by its short shrubby habit, grayish puberulence, small, petiolate, narrowly elliptic and spine-tipped leaves, unusual pink flowers with the sepals turning white with age, and distinctive rounded fruits with dense whitish hairs and longer barbed spines. The species is known only from northern Guanacaste Province in Costa Rica, where it ranges over a wider area than its congener, *K. revoluta*.

Krameria revoluta Berg, *Bot. Zeitung* (Berlin) 14: 751. 1856. Figure 1.

Small shrubs or herbs with woody bases, to 50 cm tall, with many branches, woody stems 2-5 mm thick, dark gray to blackish and glabrescent, with longitudinal fissures or smooth, leafy internodes 1-4(-8) mm long, 0.6-2 mm thick, grayish white with appressed ascending strigillose hairs 0.9-1.5 mm long. Leaves alternate,

grayish or grayish white, sessile or subsessile (petioles less than 2 mm long if present); leaf blades 6-22 mm long, 1.2-2.8(-3.5) mm broad, linear to linear-lanceolate (narrowly lanceolate), tapering gradually to the acute apex, with a small glandlike tip or spine that dries dark, abruptly narrowed at the base, margins usually revolute when dried, covered with white or pale grayish appressed-ascending strigose hairs ca. 0.5 mm long. Inflorescences terminal racemes (but flowers may appear to be solitary in distal leaf axis in early stages because of the leaflike bracts), flowers borne on slender strigillose peduncles 4-12 mm long, usually with 2 opposite leaflike linear bracts in the middle, larger outer sepals 5-9 mm long and ca. 3 mm broad, appressed whitish sericeous on the outside, petaloid (upper) petals ca. 6 mm long and 2.5 mm broad, basally connate for 3.4-4 mm, blades yellow or dull red to brownish red, glandular petals orbicular, 2-3 mm in diameter; stamens ca. 4 mm long. Fruits 4-6 mm in diameter (to 11 mm measuring the spines), globose to ovoid, covered by short dense whitish hairs and slender red and yellow spines to 3.5 mm long, spines with retrorse barbs.

Plants of seasonally very dry deciduous forest and shrub communities, from 50 to 250 m elevation in Costa Rica (to 1400 m elsewhere). Flowers and fruits have been collected in September and October in Costa Rica. The species flowers from July through December elsewhere. The species ranges along the Pacific side of middle America, from southern Mexico to northwesternmost Costa Rica.

Krameria revoluta is recognized by its almost linear alternate leaves covered with whitish hairs, unusual yellow and dusky rose flowers, puberulent fruit with barbate spines, and restriction to very dry habitats. In Costa Rica the species is known only from two collections made in Santa Rosa National Park, Guanacaste (*Salas & Poveda s.n.* [1974] CR, *Callaway 485 CR*).

OXALIDACEAE

By William Burger

REFERENCE—Alicia Lourteig, Oxalidaceae, in R. E. Woodson, R. W. Schery et al., *Flora of Panama*, *Ann. Missouri Bot. Gard.* 67: 823-850. 1980.

Herbs, rarely shrubs or small trees; stipules present and adnate to the petiole or absent. Leaves alternate, subopposite or closely clustered (sometimes all basal), pinnately or palmately compound, often (in *Oxalis*) trifoliolate, rarely unifoliolate, often folding up at night, petiolate, the leaf blades usually entire. Inflorescences axillary or cauliflorous, usually cymes, sometimes in compound racemiform or umbelliform panicles, some-